THE

AGRICULTURAL BULLETIN

OF THE

FEDERATED MALAY STATES.

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THE AGRICULTURAL BULLETIN OF THE FEDERATED MALAY STATES.

For some few years past the Department of Agriculture has issued under the name of "Bulletins" occasional publications dealing with various subjects connected with the agriculture of the country. These bulletins are complete in themselves and deal only with lines of work which have been brought to definite conclusions. From the nature of things such work must take several months, if not years, and in the mean time any information that may be brought to light during the progress of the work is withheld from planters and others interested.

In the course of visits to Estates and in their other work, officers of the Agricultural Department meet with facts and cases which are not sufficiently important to warrant the publication on them of a special bulletin and yet they would be of interest and value to other agriculturists. Progress notes on experimental work are also withheld from publication, although they often give indications of value.

For these reasons, besides others, it has been felt that the Department requires a regular periodical in which all small articles of immediate interest could be published. In the past the "Agricultural Bulletin of the S.S. and F.M.S.," edited by Mr. Ridley, has to a certain extent met this want, but with the growth of the agriculture of the F.M.S. and the concurrent growth of the Department of Agriculture, that has become insufficient, and it has been decided that the Department should itself conduct a monthly journal. That the need of such a periodical is realised by agriculturists is shown by the hearty support given by the Planters' Association of Malaya, which has resulted in this journal being from the first issue the organ of that Association as well as of the Department of Agriculture. In this connection it is interesting to note the growth in size of the Department of Agriculture; founded in 1905,

the staff consisted of the Director, who was also Government Botanist, and in addition the Inspector of Coconut Trees and the Superintendent Experimental Plantations, Selangor. In 1912 in addition to the Director there are fourteen European Officers on the staff, the whole of whose time is devoted to the study of agricultural questions. Comparing this with the output of our largest agricultural product, the F.M.S. in 1906 produced less than 900,000 lbs. of rubber, while during 1911 the production was nearly 22,000,000 lbs.

In addition to articles by Officers of the Agricultural Department and the minutes of Planters' Association of Malaya meetings the Editor will welcome contributions from planters and others interested in Agriculture. Many managers carry out experiments in every branch of their work and frequently meet with interesting facts in connection with their work, the results from which never reach anyone but a few friends to whom they are mentioned. It is hoped that planters will regard this as their journal and contribute to it freely.

I cannot let this opportunity pass without paying some tribute to the "Agricultural Bulletin of the S.S. and F.M.S." Under the able editorship of Mr. H. N. Ridley, F.R.S., it has, since 1891 as an occasional publication and since 1901 as a monthly journal, been the great source of information on agricultural matters in Malaya. Times change and it is hoped that the present journal, conducted by a large staff of specialists, will meet modern requirements in Malaya better than its predecessor; yet if it meets them as well as its predecessor met those of its day, I shall be more than satisfied. The excellence of the "Agricultural Bulletin of the S.S. and F.M.S." is only one example among many of Mr. Ridley's devotion to agriculture and his ability as scientific agriculturist.

L. LEWTON-BRAIN.

THE NEW YORK RUBBER EXPOSITION, THE MALAYAN EXHIBIT.

BY L. LEWTON-BRAIN, *Director of Agriculture.*

In February, 1912, it was decided that Malaya should take part in the International Rubber Exposition, which is to be held in New York in September—October of this year.

The Federated Malay States Government agreed to guarantee the whole cost of the Malayan exhibit and a cable was sent to the Malay States Information Agency to reserve space for this country. Later it was found necessary to secure nearly double the space originally taken.

It was also decided by the Federated Malay States Government to remit the export duty on all approved exhibits, in order to encourage estates to participate. Later the same privilege was extended to rubber intended for competition at the Exposition.

The Planters' Association of Malaya decided to support the Exhibition and agreed to leave the arrangement in the hands of the Director of Agriculture. The constituent estates were circularised by the Association and asked to contribute to the cost of theExposition. It was arranged that local subscriptions were to be paid to the Director of Agriculture and those abroad to the Secretary, Rubber Growers' Association.

The weak spot in the Malaya exhibit at the London Exhibition in 1911 was undoubtedly the small number and small size of the Exhibits. Manufacturers were not likely to be impressed with the commercial possibilities of plantation rubber when this could only be shown them in a few samples of 25 lbs. each.

A circular was therefore sent to each producing estate, asking the Manager to reply whether he would or would not contribute to the general Exhibit. The minimum size of each sample was fixed at 100 lbs. Very satisfactory replies were received, the majority of estates agreeing to contribute one or more samples of this size.

A later circular fixed the dates of sending in contributions between June 10 and 20th and it may be mentioned that most of the exhibits arrived nearer June 20th than June 10th. A few estates that had promised to contribute found themselves unable to do so, while, on the other hand, some sent more then they had promised.

The following committee was appointed by the Government to select such exhibits as they thoughout representative of Malayan Plantation rubber to be forwarded to New York:—

Director of Agriculture (Chairman), the Hon. E. B. Skinner, Messrs. Brock, F. G. Harvey, P. W. N. Farquharson, E. P. Howard, W. Duncan, C. T. Hamerton, M. Barrowcliff and S. Morgan. The committee met on June 22nd and a thorough examination of the rubber was made; in all nineteen samples were rejected out of a total of 174. Most of these were refused on account of not being sufficiently dry and one or two on account of the rubber being non-uniform or stained. Nearly all the samples were of excellent quality.

In order to give people interested in the Exposition an opportunity of seeing a representative collection of plantation rubber, arrangements were made to hold a preliminary exhibition at the Masonic Hall, Kuala Lumpur, on June 24th. Invitations were sent out by the Committee. The exhibition aroused keen interest among planters and residents of Kuala Lumpur and the Hall was closely packed during the whole time it was open and in fact for sometime before and after the hours fixed. The opinion was

generally expressed that we had succeded in getting together a very fine collection, especially of the finer grades of sheet and crepe.

After the exhibition the rubber was all carefully re-packed and was forwarded to New York by the S.S. "Prometheus" leaving Port Swettenham on July 4th. On arrival there it will be delivered to Mr. L. Wray, I.S.O., who has charge of the Malayan section in New York. Each case contained a card setting forth the name of the Estate, the address of its Head Office, and the grade and quantity of the rubber. Every opportunity will therefore be given to would be purchasers of shares or rubber to get all the information they require about the exhibits in which they are interested.

The unpacking and re-packing of the Exhibits was done under the immediate direction of Mr. F. G. Spring, the Agriculturist of the Department.

The following is a final list of the main exhibits as forwarded. Special mention must be made of the splendid contributions made by the Sungei Kapar Rubber Co., which comprised 11 cases of smoked sheet, 2 cases of No. 1 crepe, 8 cases of block, and 1 case of No. 4 crepe. The whole total amounts to 3,047 lbs. and it is certain that a contribution of this magnitude will impress American rubber buyers with the fact that plantation rubber is produced in commercial quantities.

SMOKED SHEET.

Kuala Selangor Rubber Co., Kuala Selangor Estate.	1.	Case.	158.	lbs.
Penang Sugar Estates Co., Caledonia Estate.	1.	,,	143.	,,
Pondok Tanjong Estate (Handmade)	1.	,,	165.	,,
Sengat Rubber Estates Ltd.	1.	,,	100.	,,
Rembia Rubber Estate, Rembia Estate.	1.	,,	117.	,,
Selangor Rubber Co., Sungei Rengam Estate.	1.	,,	120.	,,
Jugra Estate.	1.	,,	129.	,,
Port Swettenham Rubber Co., (including 2 blocks)	1.	,,	130.	,,
Vallambrosa Rubber Co., Vallambrosa Estate.	1.	,,	145.	,,
Pondoland Estate (Handmade)	1.	,,	120.	,,
Highlands & Lowlands Para Rubber Co., Midlands Estate.	1.	,,	125.	,,
Pandan (Johore) Rubber Estates, Adda Estate.	1.	,,	100.	,,
Gedong (Perak) Rubber Co., Gedong Estate. One light One dark.	2.	,,	273.	,,
Kota Tampan Rubber Co., Kota Tampan Estate.	1.	,,	109.	,,
Juru Estates, Juru Estate.	1.	,,	101½.	,,
New Crocodile River (Selangor) Rubber Co., Telok Datoh Estate.	1.	,,	100	,,

Bukit Raja Rubber Co.,	1.	Case.	100.	lbs.
Chersonese (F.M.S.) Estates, Chersonese Estate.	2.	,,	202.	,,
Bukit Kubu Estate.	1.	,,	120.	,,
Alma Estates Ltd, Alma Estate.	1.	,,	112.	,,
Sungei Kapar Rubber Co., Sungei Kapar Estate.	11.	,,	1,568.	,,
Shelford Rubber Estates, Shelford Estate.	1.	,,	115.	,,
Kota Tinggi (Johore) Rubber Co., Kota Tinggi Estate.	1.	,,	112.	,,
Pelepah Valley (Johore) Rubber Estates, Pelepah Estate.	1.	,,	102.	,,
Seafield Rubber Co., Seafield Estate.	1.	,,	158.	,,
Bidor Rubber Estates, Bidor Estate.	1.	,,	110.	,,
Klanang Produce Co., Klanang Estate.	2.	,,	200.	,,
Bukit Toh Alang Rubber Estates.	1.	,,	112.	,,
Linggi Plantations, Klang Lands Estate.	1.	,,	110.	,,
Tremelbye Estate.	3.	,,	347.	,,
Kuala Lumpur Experimental Plantation.	1.	,,	164.	,,
Total Smoked Sheet.	46.	,,	5,767¼.	,,

UNSMOKED SHEET.

Bukit Timah Rubber Estates, Bukit Timah Estate.	1.	,,	100.	,,
Ratanui Rubber Estate.	1.	,,	114.	,,
Che Woh Estate.	1.	,,	100.	,,
Yam Seng Estate.	1.	,,	104.	,,
Dominion Rubber Co., Hendra Estate.	1.	,,	100.	,,
Total Unsmoked Sheet.	5.	,,	518.	,,

No. I. CREPES.

Penang Sugar Estates Co., Caledonia Estate.	1.	Case.	111.	lbs.
Selinsing Rubber Co., Selinsing Estate.	1.	,,	125.	,,
Ledbury Rubber Estates, Sione Estate (blanket).	1.	,,	100.	,,
Bukit Timah Estate.	1.	,,	100.	,,
Cicely Estate.	1.	,,	110.	,,
Pahang Rubber Co., (blanket).	2.	,,	217.	,,
Banteng (Selangor) Rubber Co., Puchong Est.	1.	,,	116.	,,
Straits Rubber Co., Gedong Estate.	1.	,,	100.	,,
Vallambrosa Rubber Co., Vallambrosa Estate.	1.	,,	55.	,,
Matang Estate.	1.	,,	105.	,,
Consolidated Malay Rubber Est., Atherton Est.	1.	,,	115.	,,

Labu (F.M.S.) Rubber Co., Labu Estate.	1.	Case.	100.	lbs.
Harpenden (Selangor) Rubber Co., Harpenden Estate.	1.	,,	120.	,,
Batu Caves Rubber Co., Batu Caves Estate.	1.	,,	104.	,,
Balgownie Rubber Estates, Singapore, Balgownie Estate.	1.	,,	100.	,,
Ratanui Estate.	1.	,,	110.	,,
Inch Kenneth Rubber Estates, Inch Kenneth Estate.	1.	,,	100.	,,
F.M.S. Rubber Co., (One Thin & One Thick.)	2.	,,	233.	,,
Consolidated Malay Rubber Est. Ainsdale Est.	1.	,,	112.	,,
Carey United Rubber Estates, Paradise Estate (Hot Air Dried).	1.	,,	100.	,,
Glenshiel Rubber Estates, Glenshiel Estate.	1.	,,	101.	,,
Oriental Rubber Co., SungeiMahang Estate.	1.	,,	112.	,,
Padang Rubber Co., Wellington Estate.	1.	,,	100.	,,
Pajam Ltd, Pajam Estate.	1.	,,	135.	,,
Sungei Salak Rubber Co., New Labu Estate.	1.	,,	112.	,,
Mount Austin (Johore) Rubber Estate, Mount Austin Section.	1.	,,	125.	,,
Edinburgh Rubber Estates (Selangor) Edinburgh Estate.	2.	,,	234.	,,
Castlefield Rubber Co., Castlefield Estate.	1.	,,	104.	,,
Trong Rubber Estates, Trong Estate. (1 thin, 1 medium, 1 thick).	3.	,,	375.	,,
Krian Rubber Estates.	1.	,,	106.	,,
Bukit Raja Rubber Co.,	1.	,,	100.	,,
Kepong (Malay) Rubber Estates, Kepong Estate (1 thick, 1 thin).	2.	,,	272.	,,
Chersonese (F.M.S.) Estates, Chersonese Estate (1 thick, 1 thin).	2.	,,	203.	,,
Selangor Central Factory.	1.	,,	119.	,,
Kuala Lumpur Rubber Co., Kent Estate (1 blanket, 1 thin).	2.	,,	235.	,,
Linggi Plantations, Rantau Division.	1.	,,	130.	,,
Jebong (Perak) Rubber Co., Jebong Estate.	1.	,,	100.	,,
Sungei Kapar Rubber Co., Sungei Kapar Estate (1 thick 1 thin).	2.	,,	236.	,,
Seremban Rubber Estates Co., Seremban Est.	1.	,,	140.	,,
Kirby Estate. (1 blanket, 1 thin).	2.	,,	221.	,,
Gula-Kalumpang Rubber Co., Gula Estate.	1.	,,	100,	,,
Batu Tiga (Selangor) Rubber Co., Glenmarie Et.	1.	,,	100.	,,
Linggi Plantations, Linggi Estate.	1.	,,	133.	,,
Tremelbye Estate.	1,	,,	106.	,,
	54	,,	6,029.	,,

Block Rubber.

Batu Gajah House Bstate (Smoked).	1.	Case.	101.	lbs.
Sungei Kapar Estate.	8.	,,	1,104.	,,
Lanadron Rubber Estates, Lanadron Estate.	1.	,,	100.	,,
Total Biock Rubber.	10.	,,	1,305.	,,

Smoked Crepe.

Mount Austin (Johore) Rubber Estates, Pandan Sect:	1.	Case.	125.	lbs.
Bukit Raja Rubber Co.,	1.	,,	104.	,,
Tremelbye Estate.	1.	,,	114.	,,
Total Smoked Crepe.	3.	,,	343.	,,

Lower Grades Crepe.

Penang Sugar Estates Co., Caledonia Estate. No. 2.	1.	Case.	118.	lbs.
Ledbury Rubber Estates, Sione Estate No. 2.	1.	,,	100.	,,
,, ,, ,, Tree Scrap.	1.	,,	100.	,,
,, ,, ,, Bark Scrap.	1.	,,	100.	,,
,, ,, ,, Earth Scrap.	1.	,,	100.	,,
Dusun Durian Estate, Bark Scrap.	1.	,,	110.	,,
,, ,, Scrap Crepe.	1.	,,	110.	,,
Straits Rubber Co., Gedong Estate. Bark Scrap.	1.	,,	100.	,,
Jugra Estate. Bark Scrap.	1.	,,	135.	,,
Vallambrosa Estate. Scrap Crepe.	1.	,,	163.	,,
Consolidated Malay Rubber Estates, Atherton Estate, Bark Scrap.	1.	,,	115.	,,
,, ,, Ainsdale Estate Bark Crepe.	1.	,,	112.	,,
,, ,, Ainsdale Estate No. 2 Crepe.	1.	,,	112.	,,
Labu (F. M. S.) Rubber Co., Labu Estate. No. 2. Crepe.	1.	,,	100.	,,
F. M. S. Rubber Co., Scrap Crepe.	1.	,,	109½.	,,
Padang Rubber Co., Wellington Estate. Bark Scrap.	1.	,,	100.	,,
,, ,, ,, Scrap Crepe.	1.	,,	100.	,,
Castlefield Rubber Co., Castlefield Estate Scrap Crepe.	1.	,,	102.	,,
,, ,, ,, Bark Crepe.	1.	,,	106.	,,
Chersonese (F. M. S.) Estates, Chersonese Estate, Scrap Crepe.	1.	,,	102.	,,
Selangor Central Factory. No. 2. Crepe.	1.	,,	119½.	,,
,, ,, ,, Scrap Crepe.	1.	,,	120½.	,,

Kuala Lumpur Rubber Co., Kent Estate. No. 2.	1.	Case.	100. lbs.
„ „ „ No. 3.	1.	„	95. „
Jebong (Perak) Rubber Co., Jebong Estate. Bark Scrap.	1.	„	100. „
Sungei Kapar Rubber Co., Sungei Kapar Estate. No. 4. Grade.	1.	„	119. „
Seremban Estate. Co., Seremban Estate. Lump Crepe.	1.	„	120. „
„ „ „ Scrap Crepe.	1.	„	120. „
Kirby Estate. Scrap Crepe.	2.	„	224. „
„ „ „ Bark Crepe,	1.	„	113. „
„ „ „ No. 2. Scrap.	1.	„	113. „
Damansara Estate. Scrap Crepe.	1.	„	150. „
Gula-Kalumpang Rubber Estates, Gula Estate Bark Scrap.	1.	„	100. „
Batu Tiga (Selangor) Rubber Co., Glenmarie Estate No. 2. Crepe.	1.	„	100. „
Linggi Plantations, Linggi Estate. No. 1. Scrap.	1.	„	100. „
Tremelbye Estate. No. 3. Blanket.	1.	„	81. „
Total lower Grades Rubber.	37.	„	4,069½. „

Jelutong.

Messrs Boustead Hampshire & Co., Refined Jelutong, 1 case, 60 lbs.

Coconuts.

In addition to the rubber it had been decided that each country should be allowed to exhibit other main products at the Exposition. The following collection was therefore made and despatched on the same date as the rubber.

Klanang Estate, 2 cases Coconuts, 1 case Copra.

Permatang Estate, 4 cases Coconuts, 1 case Copra.

Coconuts and Copra were also purchased in Perak and 2 cases of each forwarded, while 1 case each of Copra, Coir matting, Coconut oil cake and Coconut oil were purchased in Selangor.

Indexed Exhibit.

A small scale exhibit, comprising specimens of *Hevea Brasiliensis*, wild rubber, *Ficus elastica* and crops which are employed in the Federated Malay States in connexion with the cultivation of Para rubber, has also been collected and forwarded to New York. This exhibit is intended principally to show on a small scale some features of Para rubber cultivation in the Federated Malay States It

will be indexed and will be provided with a suitable catalogue for reference. The following are the items included :—

Botanical specimens (dried and pressed)
- Para Rubber in flower and fruit.
- Seedlings of Para Rubber.
- Passion Flower (*Passiflora foetida*)
- *Mimosa pudica.*
- *Crotalaria striata,*
- Rambong—young shoots.
- Getah Gerit Merah young shoots.
- Getah Gerit Puteh „ „
- Getah Gerit Hitam „ „
- Getah taban in flower.

Sections of trunks of
- Para Rubber.
- Getah Gerit Hitam
- „ „ Merah.
- „ „ Puteh.

Rubber :
- Para smoked crepe.
- Rambong block.
- Rambong crepe.
- Rambong scrap.
- Rambong balls (native).
- Getah Gerit balls.
- Getah Gerit Grepe.
- Getah jelutong.

Living plants of *Hevea.*

Samples of products :
- Robusta coffee.
- Liberian coffee.
- Patchouli oil.
- Patchouli essence.
- Para seed oil.
- Tapioca.
- Gambir.

Para seeds.

Para seeds kernels.

Para stumps.

Felling tools.

Planting tools.

Tapping knives.

Native knife for tapping rambong.

Coagulating dishes.

Coagulants.

Four gallons of latex treated with formalin.

In addition to these, well over 100 photographs have been sent to England for enlargement and framing. These will be used for the decoration.

The General Manager, Federated Malay States Railways, has also forwarded several photographs and posters which will aid in the decoration of the Malayan Section.

A collection of statistics was forwarded some time ago showing the growth of the Malayan rubber industry from 1905 to 1911. These will be used for the preparation of wall diagrams and will call attention to the enormous development that has taken place.

The pamphlet by Mr. Ridley and the Director of Agriculture on the Rubber Industry, of Malaya has been revised and brought up to date and Mr. L. C. Brown's pamphlet on Coconuts will again be distributed.

As stated before Mr. L. Wray is in charge of the Malayan section in New York, while Mr. Baxendale of Jugra will be the Planters Association of Malaya delegate at the exhibition.

A NOTE ON THE USE OF SODIUM BISULPHITE IN THE PREPARATION OF RUBBER.

BY. M. BARROWCLIFF.

The increasing extent to which use is being made of sodium bisulphite in the manufacture of pale crêpe and for prevention of the troublesome surface oxidation so frequently encountered when coagulating latex, and the number of enquiries regarding it received at the Department of Agriculture, seems to render desirable a published statement of the quantities of this substance needed for the fulfilment of its various purposes, and of the limitations attending its employment.

The solution used in the following formulae was of 5% concentration, prepared by dissolving ½ pound of sodium bisulphite in one gallon of water, and the latex employed, one very susceptible to oxidation, contained approximately 18% of rubber (yielding 1¾ lb. of dry rubber per gallon). The coagulant, acetic acid, was added in the proportion of 2 ounces of a 5% solution (1 in 20) to each gallon of latex.

For the preventation of surface oxidation the minimum quantity found to be effective was ½ ounce of the bisulphite solution per gallon of latex, representing 1 part of pure sodium bisulphite in 6,500 parts. The resulting clot had a perfectly white firm surface, and dried when manufactured into fine crêpe to a pale brown colour, considerably superior in appearance to rubber made from the same latex without adding bisulphite.

This proportion was found a suitable one to use when preparing sheet intended for smoking, although even with this small quantity an appreciable increase in the time necessary for drying and smoking was observed.

Using double the above amount of bisulphite, 1 ounce of solution to each gallon, proportion 1 in 3,250, the colour of the resulting thin crêpe was a slightly brownish yellow. This amount might be used for smoked sheet in cases where the tendency to oxidation is exceptionally great and for latices rich in rubber and to which no water has been added. For thick crêpe or unsmoked sheet this or the smaller quantity should only be used where facilities exist for rapid drying, as otherwise the increased length of time take taken for this process would heighten the probability of developing mould.

Again doubling the quantity and adding two ounces of the bisulphite solution per gallon, giving a proportion of approximately 1 in 1,600, the colour of the thin crêpe obtained was a very pale yellow.

This or larger quantities should not be used for sheet as the time of drying is lengthened and no compensating advantage obtained.

Employing 4 ounces of bisulphite solution, 1 in 800, a creamy yellow crêpe resulted, and with 8 ounces, 1 in 400, a pale golden yellow colour was obtained.

Taking into consideration the appearance of the rubber, rate of drying, and economy in the use of bisulphite it seemed to the writer that the most satisfactory procedure was to use for fine crêpe the propotion of 1 in 1,600, 2 ounces to the gallon. As however in practice considerable variations exist in the rubber content of latex as it reaches the factory, in its susceptibility to oxidation, and in the rate of drying, planters intending to take up the use of bisulphite are recommended to try experimentally the effect of using varying quantities as described above, and from the results obtained to decide upon their ultimate procedure.

The chemical interaction between sodium bisulphite and acetic acid in solution results in the formation of sodium acetate and sulphurous acid, and the former substance, being non-volatile and tenacious of moisture, is undoubtedly the cause of the diminution in the speed of drying. Sulphurous acid (sulphur dioxide), on the other hand, being very volatile, passes away during drying. Now one part of acetic acid is able to convert only 1.73 parts of sodium bisulphite into sulphurous acid and sodium acetate, so that 2 ounces of 5% acetic acid act in this way upon 3½ ounces of 5% bisulphite. Using therefore only this quantity or less, no bisulphite can exist in the rubber after drying, whilst with larger amounts probably 20% of the excess remains through all the subsequent operations, which, on theoretical grounds and with remembrance of the tendency of

'sulphite bleached' fibres, for instance, to deteriorate on long keeping owing to the formation by oxidation of the highly corrosive sulphuric acid, hardly seems desirable.

REPORT ON SOME INDIAN LOCUSTS.

By C. B. Holman-Hunt, Ag. Entomologist.

The following notes and hints on a pest which occurs in India may be of value.

The locust is an Orthopteron *i.e.* an insect with the ample lower wing folded rather in the form of a fan below the narrow stiff upper wing. The scientific division of the Orthoptera is rather muddling, as the true locusts which are migratory grasshoppers with short horns and a short ovipositors are included in the Acrididae, while the long horned solitary grasshoppers with long ovipositors are included in the Locustidae. This may confuse those who look for Locusts under the Locustidae.

The Locusts have three joints to the feet, while the Locustidae have four.

They pass through an incomplete metamorphosis (*i.e.* between the larval or nymph stage and the adult or winged stage they *do not* become pupae, a state occurring in most other insects when they are swathed in a chitinous covering and eat no food), so they are dangerous from the moment that they leave the egg.

There are at least 5 Indian Locusts.

Chrotogonus trachypterus about $\frac{3}{4}$ inch long, thicker in the centre and tapering at either end.

Atractomorpha crenulata, about 1 inch long, with a very pointed projecting forehead and the mouth close to and under the first pair of legs.

Hieroglyphus furcifer, between 1 and 2 inches long. Shanks of the hind legs blue, of about equal thickness and height all along.

Acridium succinctum, $2\frac{1}{2}$ to $3\frac{1}{2}$ inches. Lower wing red when opened. Thorax lightly marked with fuscous. Shape as H. furcifer.

Acridium peregrinum $2\frac{1}{2}$ to 3 inches, yellow pink or purple red, black speckled. Shape as H. furcifer.

For further description see Memoirs of Department of Agriculture, India. Vol. I No. 2. (June, 1907) price Rs. 3/-, printed by Messrs. Thacker Spink & Co., Calcutta.

The above descriptions only refer to the adult stages. The young stages of course are smaller in size and vary considerably from the adult in colour.

Any swarms of grasshoppers either in the hopping or flying stage seen in the Malay States should be reported to the Director of Agriculture, as they would be dangerous pests to padi fields, and

it is quite possible for them to be blown over from neighbouring islands or continents, and it is important that they should be tackled at once. The best stage to attack them in is when they are young hoppers.

They would of course arrive as fliers and then lay eggs, in swampy places probably, in masses below the ground. These would hatch out after some weeks into hoppers, which feed and grow up rapidly, gradually forming wings.

NEW COVER CROP.

Dolichos biflorus. (Horse Gram).

By F. G. Spring, Agriculturist.

During the past 18 months seed of some 30 varieties of plants have been procured from India, Philippine Islands, Barbados, Antigua etc. for the purpose of attempting to secure a cover crop for this country which would fulfill the necessary requirements. After a long series of experiments I have come to the conclusion that one of the cover crops that may possibly meet with success is Horse Gram.

Dolichos belongs to the family of the Leguminosae and is either sub-erect or twining in habit. It is largely cultivated in South India and is wild in the Himalayas. It is stated that on the plains of India this pulse is grown either as a green manure or as a cattle food and fodder, and that few Indian crops are perhaps more valuable in this respect than the horse gram, especially when grown as a green manure. Its great value in this respect lies in its power, in common with other leguminous plants, of fixing atmospheric nitrogen in the soil through the agency of bacteria contained in the root nodules and by so doing it increases the fertility of the soil and indirectly the growth of the Rubber growing amongst it. Being a close growing dense-shading plant it keeps the surface soil damp and prevents it from being baked by the heat of the sun.

Although not deemed a superior pulse it is largely used by the poorer classes owing to its being perhaps the cheapest of pulses. The husk is regarded as a valuable cattle food. The split peas may be reduced to a meal or may be boiled or fried and eaten with rice or other articles of food. There is a fairly extensive trade done locally with the seed.

Cultivation.

The ease with which it may be cultivated recommends it most highly. The plant may be made to grow at any season of the year as it requires but one shower of rain to start its growth, but even

if this be not obtained the seed will remain alive for months in the soil and germinate after the first rain.

The land should be chungkolled, or when possible ploughed, the weeds collected and burnt, and the seed sown broadcast at the rate of 12 to 15 pounds per acre. It is advisable to cover the seed and this may be done by breaking up the surface lumps of earth or chungkolling the land to the depth of one or two inches. No after cultivation is necessary until the crop is mature, which is in about five months time. The seed is then collected, and if a second crop is required, the land chungkolled and the seed resown. It is advisable to plant the second crop as soon as the first has died down in order that the weeds may not have an opportunity of getting the upper hand. Horse gram grows on the poorest land but it is best suited to a mixed soil.

Value as a Cover Crop.

Two plots, similarly weedy, and containing lalang, were selected for this experiment. These areas were chungkolled and in one of them seed of horse gram sown. Two crops were obtained in one year which necessitated weeding the land twice. Comparing this with the control plot which had to be cleaned every month it will be seen that there is a great saving of labour, and that from an economic point of view it is most satisfactory. As to its primary value, namely the checking of lalang growth, I would not go so far as to say that it eradicates weeds, but it had certainly the advantage over the control in that the plot containing it was freer from lalang at the end of the year's experiment. It has an advantage over most other cover crops in dying down naturally and therefore has not to be eradicated by chungkolling, previous to tapping, as Java Crotalaria, Tephrosia purpurea etc., have to be In view of its power of checking the vigorous growth of lalang, its beneficial chemical, mechanical, and bacteriological effect on the soil and the saving of the labour bill, I would recommend that this cover crop be given a trial, where a cover crop is required.

Mr. Munro, Managing Director, Permatang estate was favourably impressed by this crop, but unfortunately his plants were eaten by slugs. Mr. Munro is replanting a portion of his land with it.

ORNAMENTAL FLOWERING SHRUBS.

By J. Lambourne, Asst. Superintendent Govt: Plantations, Selangor and Negri Sembilan.

There has been a great demand, of late, for ornamental shrubs and flowering plants suitable for planting near bungalows or other places that require beautifying. A few remarks on their cultiva-

tion, propagation and general management, with a list of a few of the most suitable species and varieties for the purpose may be of some use to planters and others who may wish to add to the beauty of their surroundings.

Propagation.

Most of the plants I shall mention will propagate readily from cuttings. For this purpose well matured young shoots are the best. These should be cut into lengths of about nine inches, taking care to make a clean cut just below a joint, and insert about six inches apart in a nursery bed of sandy soil made up for the purpose. The cuttings should be shaded from the strong rays of the sun for a few days, until they have rooted. The cuttings, when rooted, should be transplanted about 2 feet apart in another nursery bed, where they will make good sized plants for planting in permanent quarters.

Preparation of Soil for Planting.

Ornamental as well as other plants require a good soil to give the best results. The soil therefore should be well drained and in a good state of fertility. If the soil to be contended with does not come up to this standard it should be improved as far as possible by adding the necessary constituents. Whether it is intended to plant in groups or as isolated specimens the soil should be deeply dug. If the soil is poor it should be either be replaced by good soil, or improved by adding manure, leaf mould, etc. It is not advisable however to add too much manure at the time of planting but to wait until the plants have established themselves; it can then be added as a top dressing if required.

Planting.

The plants should be lifted carefully from the nursery bed so as not to injure the roots more than can be helped. The holes to receive the plants should be dug large enough to contain the roots without cramping them. Before planting cut away all broken or decayed roots that may be present, with a sharp knife. Place the roots in the hole that has been dug and lay the roots out comfortably without cramping them; the soil should then be worked in among the roots and pressed firmly down. A good watering should then be given to settle the soil about the roots.

After Treatment.

This should consist in keeping down weeds and stirring the soil periodically about the roots to admit air and conserve moisture. Pruning is another important duty which should be religiously carried out if good shapely plants with plenty of flower are required.

Flowering plants for purposes of pruning can be placed under three heads; (1) those that flower on the old wood; (2) those that flower on both young and old wood; and (3) those that flower on the young wood of current growth only. In the case of the two former very little pruning is required, except for the removal of all dead and superfluous branches, keeping the plant in shape and removing all inflorescences after flowering. In the case of those that flower on the young growths, all the shoots should be cut back after flowering to within a few buds of their base. All dead wood and snags should be removed, as if left on, they form an excellent medium for the growth of fungus disease.

The instrument to be used in pruning these shrubs should not be a parang as is too often the case if left to a coolie, but a sharp knife or a pair of secateurs should be used for smaller branches and a saw for the larger ones. In all cases a clean cut should be made close back to the stem, branch, or bud as the case may be, so as to avoid leaving any snags that may decay and set up fungus or other disease which may spread to the whole plant. The following is a list of flowering shrubs suitable for ornamental work. These are only a few of numerous plants suitable for this purpose but they will suffice to decorate a garden of almost any size with all the flowering shrubs required.

Flowering Shrubs.

Allamanda Schottii, *A. Williamsii*, *A. neriifolia*, *A. cathartica* and *A. violacea*, are all natives of Tropical America but commonly grown in gardens in the Eastern Tropics. They all bear large bell shaped flowers of various shades of yellow, except the last mentioned, which, as its name suggests bears purplish flowers. The flowers are all borne near the tips of young shoots. The shrub itself is inclined to straggle if it is not kept within bounds by pruning; this should be done as recommended for plants flowering on young shoots.

Acalypha hispida is a native of New Guinea and bears long catkins of red flowers which hang gracefully from the plant.

Bourgainvillea glabra and its variety *sanderiana* are both worthy of cultivation. They are natives of Brazil and bear small flowers which are surrounded with comparatively large purple bracts; these are borne in profusion along the young shoots. These plants have one objection, and that is, the long hooked spines which are borne on the shoots. These make it rather an awkward plant to prune but if this is done periodically after flowering the plant can be kept within bounds fairly easily.

Brunfelsia americana and *B. calycina* are both good flowering shrubs. They are both natives of Tropical America and should do well here although I must confess I have not seen a good specimen

of it in this locality. The flowers are of a purplish colour and are borne on the young shoots.

Caesalpinia pulcherrima (Barbados pride) and its variety *aurea* are both worthy of a place in the garden. Their scarlet and yellow flowers are borne in terminal racemes which make fine table decorations when mixed with its own foliage or that of Selaginella or Fern.

Clerodendron falax and *C. fragrans* are natives, the former of Java, and the latter of Malaya and China. These are both large leaved species very reluctant to branch naturally. The inflorescences are borne terminally and in the case of *C. falax* in a loose panicle of brick red flowers borne in a closer head, and is a favourite with most people on account of its sweet scented flowers. After flowering these plants should be cut back to induce them to send up several shoots instead of one as is usual.

Eranthemum Cooperi, and *E. hypocrateriforme*, the former a native of New Caledonia, and the latter of Tropical Africa, are both worthy of a place in the garden, *E. hypocrateriforme*, however is inclined to get out of bounds if not kept pruned.

Gardenia florida, its variety *radicans* and *G. tubifera* are natives the former and variety of China and Japan, and the latter of Malaya. They bear white flowers which besides being beautiful are attractive on account of their delicious scent.

Glaphimia glauca is a small shrub of Mexico and bears racemes of yellow flowers.

Ixora macrothyrsa and *I. coccinea* and its varieties are attractive on account of the large heads of red and scarlet flowers which are borne on the tips of the shoots.

Jasminum bifarium a native of Malaya and *J. Maingayi* native of Penang are both worthy of cultivation on account of their fragrant white flowers.

Medinilla magnifica native of the Philippines, and *M. javanensis* a native of Java, are attractive shrubs rather stiff growing but bearing large racemes of flower, from the old as well as the young branches, which hang gracefully from the plant; *Magnifica* is the larger of the two.

The "Oleander" (*Nerium oleander*) and its variety are both worthy of a place in the garden. This shrub I believe is familiar to every one so no description is needed.

Petrea arborea and *volubilis* both natives of America, are worthy of places in the garden on account of their blue flowers which are borne in racemes from the tips of the shoots.

Quassia amara the "Surinam Quassia" native of Guiana, is a very pretty shrub bearing brilliant red flowers in terminal spikes; it is well worthy of a place as a flowering shrub in any garden.

Tabernaemontana coronaria variety *flore pleno* a native of India does well in this country and should be grown on account of its fragrant white flowers.

Vitex negundo or *V. Agnus castus* as it is also known, is worthy of mention as a flowering shrub as is also *V. trifolia*.

Others worthy of mention are *Bixa orellana*, *Ipomoea carnea*, *Thunbergia erecta*, *Barleleria obovata*, *Plumbago capensis*, *P. capensis* var *alba*, *P. capensis* var *rosea* and the well known "Frangipani" *Plumeria lutea* and *P. rubra*.

The above list is far from complete but time and space will not allow me to mention more at the present time. I must apologise for having used all these long scientific names for the plants but owing to my ignorance of any common names except for a few, I was obliged to resort to these. The plants I have mentioned are all fairly common in the tropics, but none the less attractive.

THE TENKAWANG OR SENKAWANG TREE.

(Diploknema Sebifera Pierre).

The Tenkawang tree according to several authors is a native of Borneo. There appears to be no published record of its occurrence in any other country in the East. The tree yields "Minyak Kawang," a valuable oil which is exported in small quantities from Borneo to Singapore. The oil is used by Malays in this country for cooking purposes and recent enquiries would indicate that the tree occurs in the jungle in the Malay Peninsula. Two localities in Selangor in which it is said by Malays to occur are the Ulu Selangor and Kuala Langat districts.

Diploknema sebifera belongs to the family *Sapotaceae* and is related to *Dichopsis*, *Palaquium and Mimusops*, which contain important latex-yielding species. The oil, "Minyak Kawang," which has a high market value, is as far as is known at present obtained only from the kernels of the fruits. As the plant is of some economic importance any information with respect to its occurrence in the Federated Malay States would be valuable.

THE NEW COCONUT PEST.

By L. C. Brown, Inspector of Coconuts.

Fortunately the coconut trees grown in the Straits and Federated Malay States do not appear to suffer from the disastrous effects of certain pests to the same extent as in many other countries. Take for instance the "leaf disease;" it is always amongst us but does little or no harm to the trees and again the "bleeding disease" and

'dry rot" are practically unknown here. Whether this is due to more avourable climatic conditions or better cultivation it is difficult to say, at the same time it is undoubtedly the case that by a thorough attention to the culture of the palm a great deal can be done to resist the pests and minimise the harm being done by them. The "leaf disease" admittedly confirms this view and from my own experience I have no hesitation in saying that so far as "beetles" are concerned, these insects seldom if ever attack or penetrate into the cabbage of a strong, healthy and well developed tree; in other words, a tree that has been carefully cultured has the power of resisting most pests.

Notwithstanding the fact that the coconuts grown in the Straits and Federated Malay States are apparently more immune from some pests than is the case in other countries, it is still disquieting to learn that now another pest of a serious kind is attacking the coconut palms in the Philippines and the Governor of the Straits Settlements has in consequence taken precautionary measures to prevent its influx here by prohibiting the introduction from the Philippines of "any palms, alive or dead, or any stems of, or parts of stems or roots of palms."

The insect that does the damage is related to the so-called White Fly which ravages the citrus groves of Florida and as far as I am aware the pest has never made its appearance either in the Straits, Province Wellesley or the Federated Malay States.

Mr. D. B. Mackie, Agricultural Inspector in an article that appears in the *Philippine Agricultural Review* for March, 1912 informs us that the insect has been described by Mr. Quaintance of the Bureau of Entomology, United States Department of Agriculture, Washington, D. C. as *Aleyrodicus destructor* and states that the insect may prove to be the most serious pest of the Coconut palm in the Philippine Islands but fortunately it is at present confined to a district in Negros Oriental and is only attacking the young palms *i.e.* from 6 to 8 years of age. He states that eggs which are very minute are laid on the under surface of the leaflets, usually on the young leaves, and soon after the eggs are hatched the young insect begins walking about on the underside of the leaf and having located itself, it inserts its beak through the epidermis of the leaf and begins to suck the sap from the soft inside tissue; after becoming thus attached, the young insect seldom moves, unless disturbed, until it attains its full size. Shortly before emerging as a winged insect it stops feeding, but remains attached to the leaf. Though comparatively weak fliers, the danger of their passing through the air from one tree to another is greatly increased by the action of the wind, since when the insect may only wish to fly from one leaf to another it may be accidentally borne by the wind to a considerable distance,

The pest does not apparently kill the tree but very seriously affects the crop and the growth and as regards the remedy it appears that if the insects have already infested the trees all the leaves so attacked should be cut off and burnt and that spraying with kerosine oil may in some instances be advisable.

It ishowever very satisfactory to learn that if the pest is taken properly in hand on its first appearance there is little chance of its spreading and if this is the case I may impress again upon those interested in coconuts the importance of seeing that their plantations are thoroughly cultivated and maintained in good order.

RECENT DEVELOPMENTS IN THE HEMICAL PURIFICATION OF DRINKING WATER.

By. M. Barrowcliff, Ag. Agricultural Chemist.

An article bearing this title by S. Rideal in a recent number of the "*Chemical World*" may be worth reproducing, in view of the importance of the question to this country in general and to estates in particular.

"Considering that one of the first duties demanded and also frequently one of the greatest difficulties of a water management has been the provision of a supply which shall be physically acceptable to their consumers in regard to cleaness and colour, engineers have naturally devoted themselves to questions of subsidence and filtration, but have met with serious failings at times in the mechanical treatment of various waters. Some of the faults have been inherent to the water, and others accessory.

"Such an inherent fault as a high salinity is a very great difficulty in some parts of the world, where water which is not brackish is almost impossible to obtain, and as there is no practicable method of purifying it short of distillation it is fortunate that such liquids, if otherwise pure, are not specially unwholesome. When the sodium chloride, as in most cases of marine origin, is accompanied by a considerable amount of magnesium sulphate if we remove the magnesia by precipatation with soda we produce an equivalent amount of sodium sulphate with perhaps an improvement in taste, but a doubtful hygienic advantage. The inherent fault of undue hardness, of extreme importance from an industrial point of view, has been shown to have much less significance with regard to health, but at the same time it has been proved that such waters are much improved organically by a proper process of softening.

"Other very serious defects of certain waters are lead solvency and iron solvency. The former has been generally overcome by treatment of the water with calcium carbonate, or lime. The latter

causes grave inconvenience in various districts, and in the United States is dignified by the name of the "red plague," on account of the water in so many towns being rendered unbearably ferruginous. Investigations have proved that waters of very varying chemical composition are liable to this evil and that it is connected with the growth of certain organisms, especially of the genus *Crenothrix*, therefore the fault may be said to be rather accessory than inherent.

"There can be no doubt as to the accessory nature of the odours and taste which are often caused by the growth of algae and other organisms in reservoirs and conduits. Covering the reservoirs to exclude light discourages a large number of species, but is rather favourable to others which are not innocuous, and, however, is only applicable on a limited scale. It has been found neccessary to resort in a large number of cases to sterilising agents, and further work has shown that their use, carried out carefully and regularly as a system, could render a water free from inconveniences as well as hygienically safe. In regard to algae and infusoria, sulphate of copper has long been known to be effective, but on account of its poisonous nature being feared, has been mainly limited to emergencies. Hypochlorites and ozone have both come to extended use in various parts of the world with an experience that their expense is not unreasonable, and that they solve the old difficulty and dangers.

"Some years ago I found that a sodium hypochlorite solution was effective in preventing green growth in waters, and I have made a number of trials with waters containing various species of algae, mainly with a view to comparing the inhibitive action of hypochlorite with that of copper. The employment of the latter in the form of sulphate had met with success in various countries when used in the proportion of one part per million down to as low as one in fifty millions, and an important point was that the worst tastes and odours were generally the most susceptible. The cost was very small, but some outlay was occasioned by the systematic testing of the product for freedom from traces of the metal, after the minute amount used is precipated as a basic salt by the natural carbonate of lime of the water, the coagulating effect usually leaving the liquid very clear and bright and free from copper.

"Although the objection to the use of copper in this way was mainly a sentimental one, it was felt that hypochlorite would be preferable if it was effective, and such proved to be the case. I found that green and brown algal growths and objectionable microscopic animals could be prevented from developing by the use of small quantities of solution containing available chlorine. The different species required for their arrest varying amounts of chlorine, *Confervae* appearing the most susceptible, as available chlorine just in excess of that immediately consumed by the water, although dis-

appearing in a few hours, inhibited confervoid growth for some weeks. Desmids were slightly more resistent and in my experiments required the addition of some 0.5 part per million in excess of that immediately consumed by the water. Diatoms required about one part per million of chlorine in excess. The addition of one part of copper sulphate per million was not equal to that of 1.2 parts per million of available chlorine.

"The useful reagents and processes have been hitherto too much regarded as rivals and in competition with one another, and it has been left for a South African Engineer, Mr. Donald Leitch, who has designed and carried out the Klip Valley Water Works for supplying the large Johanesburg and Rand districts, to employ several of the processes in conjunction. It is singular that it has not earlier been seen, in analogy with medicine, that specifics that were not incompatible or antagonistic could be valuable adjutants to one another. In case of injurious organisms, for example, if any of these escaped the action of one remedy they might be dealt with by another, not to speak of the likelihood that several agents might enhance each others energy. The result of Mr. Leitch's work seems to have been most efficient, with a very moderate expense. His report just published describes the works supplying a population of nearly 370,000, included in seven municipal areas covering 365 square miles, the daily quantity of water pumped lying between seven and eight million gallons. The source is mainly from shaft boreholes in the dolomite, with some surface water and springs. The hardness is generally high, averaging 18 to 19 parts per 100,000 of which 9½ to 10 are said to be carbonate of lime and 7½ to 8 carbonate of magnesia. The supplies were often turbid and sometimes contained much iron, amounting frequently to two parts per million, which encouraged the growth of "weed" (presumably *Crenothrix* and other algae) in the mains. The water is softened by lime down to a mean of 14 parts per 100,000, and the growth of "weed" is checked by the addition of about 1 part in 3 millions of sulphate of copper. The ferrous iron contained is then oxidised and precipitated by falling through perforated plates on to beds of clinkers. This arrangement has been in use for about 18 months and answers its purpose satisfactorily; with a weekly cleaning it reduces the iron to between 0.2 and 0.3 parts per million, which given no further trouble. The total cost of the removal of iron in this way, including all capital charges is about 5*s*. 6*d*. per million gallons.

"After these operations the chemical quality is found to be excellent and the bacterial growth low, rarely more than 10 organisms per c.c., growing at 37°C. But during the summer or wet season, *Bacillus coli* is often present; sometimes only 1 in 10 c.c., but occasionally more. The Johannesburg Medical Officer, Dr. Chas. Porter, therefore recommended the use of a small quantity of

calcium hypochlorite (bleaching powder) for sterilisation, and this was adopted with success, the amount used being 7½ to 15 lbs. per million gallons, equal to 0.25 to 0.5 parts per million of available chlorine, while the total cost is about 6*s*. 3*d*. per million gallons. *Bacillus coli* is absent from the treated water and the total bacteria are generally reduced to one or two per cubic centimetre. The total cost of the works has been about £900,000 and the entire cost of the supply and treatment is given at 2*s*. per 1,000 gallons."

In considering the application of these results to this country it should be remembered that by virtue of the heavy rainfall and the deficiency of the soil in lime the waters to be dealt with would in most instances be "soft" waters and would usually be free from iron, reducing the process necessary to the one of "sterilising" with bleaching powder. This, although its application on a scale large enough, for instance, for a town water supply would necessitate the erection of special plant to ensure the even distribution of the hypochlorite, would be a simple and inexpensive matter for an estate water, involving merely the mixing of the small amount of bleaching powder necessary with the water required for one or two days supply, when within one hour it would be ready for use.

As a preventive of the dangerous water borne diseases, cholera, dysentry, etc., and as a means of obtaining even from the most unfavourable localities a water that can be drunk with a reasonable degree of inpunity this method certainly seems worthy of trial.

A BUTTERFLY PEST ON COCONUTS.

By C. B. Holman-Hunt, Acting Entomologist.

During the last two months (May and June) a number of coconut leaves were brought in by our pest Kangany with the long blades spun together. When these were opened they were found to contain a long caterpillar, some two inches long with a thin neck and a large head. These caterpillars are green above and yellow below with a purple band about 1/16th of an inch wide between the two colours. This band extends over the back on the last segment. The head is reddish brown. When they are full size, they excrete a white dust, which is of a waxy nature. These caterpillars were put into a breeding cage and after passing through the chrysalis stage have just hatched out. The chrysalis is of a brownish red colour about 1½ inches long, rather narrow and also thickly powdered with this white dust.

The resultant insect proved to be butterfly with a thick body, long pointed feelers tipped with yellow and the wings brownish purple black. The forewings have four large irregular translucent yellow patches about 1/8th to ¼th inch across and the small dot of the same translucent yellow colour.

The four patches are arranged three in a row parallel to the outer edge of the wing with the fourth above the centre one. The dot is in a line with the three patches near the point of the wing. The hind wings are of a more sooty brown and have only a small yellow spot near the base.

The butterfly is about 2¼ inches in expanse.

The name of this butterfly (a skipper in the same group as the Plantain Skipper) is *Hidari irava*. Taking June as the month of emergence, the eggs would be laid in June or early in July and the caterpillars probably hatch out about the middle of July. That would be the time to spray the leaves with a poisonous solution, as the caterpillars would be unprotected; later on when they have spun the blade together it would be more difficult to reach their feeding ground as they eat the thinner part of the tube so formed.

This insect may easily become a serious pest. The waxy excretion probably acts as a protection against rain and damp in the tubes. If the larva is wiped free of the dust a fresh lot is excreted, but I have not seen whether it comes from the skin or from the mouth.

The signs of the attack are the leaf blades being eaten away at the tips, the mid rib only being left, the blades being spun together, the white silk connecting the edges being very conspicuous when viewed from below and later on the discoloration of the leaves where the caterpillar has fed on the inner part of the tube shows the presence of the pest.

NOTES ON INVESTIGATIONS OF PLANT DISEASES IN THE FEDERATED MALAY STATES DURING 1911.

By Keith Bancroft, Mycologist.

The present article deals with the extent and distribution of diseases which were investigated during the past year and indicates some of the more important conclusions which were reached with respect to those diseases and the progress of scientific work.

The extensive areas recently established under cultivation in Para Rubber have demanded that greater prominence be given to the organisms which attack the Para rubber tree; and consequently the greater part of the time available for investigation of plant diseases has been devoted to this plant. The presence of a continuous cultivation of one plant in pure culture may reasonably be expected to lead to an increase in the damage done by parasitic fungi, merely by providing the food-supply of the parasites in large quantity. A fungus which is of little or no economic importance when it is growing under natural conditions and feeding on individual trees which

are widely separated, such as in the forest, may spread rapidly when it is introduced into an area under artificial cultivation. Accordingly, an increase in the damage done by the fungi which are parasitic on the Para rubber tree may well occur as cultivation continues. A summary, therefore, of the fungi which have hitherto been found to attack the plant in this country may be of some value to the cultivator.

During the past year the two most important diseases of the plant were the "common root disease," caused by *Fomes semitostus*, and the "die-back disease," caused by the *Diplodia*-form. A fungus *Phyllosticta ramicola*, hitherto not described as a parasite, was concluded to be the cause of death of the top shoots of young plants and appeared to spread somewhat rapidly among young rubber. The disease is described later in this note. The "pink" disease, "brown root" and "thread blight" diseases are also noted, while several other conditions not apparently attributable to parasitic fungi and bacteria are also indicated.

The spotting of prepared plantation rubber was investigated during the year and certain conclusions were made as to its origin, on which it has been possible to suggest preventive measures to this trouble.

Some coconut diseases are noted and the diseases of other cultivated plants are also given.

Diseases of Crops.

Under this head are described the diseases of cultivated crops, the magnitude and distribution of the diseases being given and the more important points noted in each case: the lines along which further investigation should proceed are also indicated.

Para Rubber (*Hevea Brasiliensis*, Mull-Arg.)

Root Diseases.

i. The disease caused by *Fomes Semitostus*, known generally as "root disease," but which should more properly be termed "the common root disease," has been recorded from all parts of the Federated Malay States and constitutes the most important disease of the plant. The greatest loss is among young rubber, and it may be said that the disease is for the most part much less abundant on plantations among trees of six or seven years and more. The reason for this is the rubber trees become infected from the fungus which is growing on the dead stumps of jungle trees. The fungus grows more rapidly and is consequently more abundant where there is a large quantity of dying and recently dead material in the land.

As the dead stumps decay the fungus becomes less abundant: but the disease may be prepetuated by means of rubber trees which have become infected, spreading from one tree to another. This

method of spread of the disease, which we may regard as secondary, takes place readily among trees of four or five years and more, owing to the close contact of the roots of adjacent trees. Accordingly, where the timber is allowed to remain in the land (the roots of the dead jungle stumps, it should be noted, are the principal source of infection; the timber which is on the surface appears to aid but little in transmitting the disease), the number of cases of disease among younger plants, say up to four or five years of age, depends on the number of infected jungle stumps which exist, *i. e.* presumably on the quantity of the fungus in the original jungle; the number of cases of the disease among older plants depends mainly on the employment or absence of employment of methods of treatment, which should be so directed as to eradicate the fungus at each point, *i.e.*, whereever an infected jungle stump has produced the disease.

Direct infection by means of the spores of the fungus, germinating on injured roots of the trees above ground, has not been observed; and the spread of the disease indirectly by the germination of the spores carried or blown on the dead stumps does not appear to count for much.

If the timber were removed from the land the number of cases of disease would be diminished; but this does not mean that the land would be free from the disease, since a certain number of dead roots must remain under-ground, in the form of the lateral roots of jungle trees, and these are capable of giving rise to infection. If the isolated cases of disease are properly treated from the outset, the secondary spread of the disease mentioned above from one infected rubber tree to another would be prevented; and it may be reasonably expected that as soon as the fungus had been removed from each spot where an infected jungle stump had given rise to disease, the fungus would disappear from the planted area. Observations have shown that this is the case. As a preventive for the root disease, the complete removal of timber from the land, owing to the heavy cost of removal, only appears to be justifiable under exceptional circumstances, where the fungus is particularly abundant and the conditions are favourable to its spread. On the other hand, the treatment for the disease should commence in each planted area as soon as cases commence to occur, usually about 12 or 18 months after the area is planted, and in some few cases sooner.

The methods of eradicating the fungus from each point of infection which have been found to be most serviceable are to sever communication within and without the area by means of a trench of 2½ feet in depth, to dig the soil over within the trench to this depth and to remove and burn all dead roots on the spot and apply lime to the area at the rate of 25 lb. to 100 square feet of surface. Where this treatment has not proved satisfactory it has been found that too small an area has been isolated; and it has accordingly been

urged that in most cases the trench should be carried beyond the next row of trees adjacent to the dead tree. This will depend on the age of the trees and distance of planting; but it is necessary to make certain that the area which has been treated includes the whole of that area which is covered by the growth of the fungus.

The fungus grows very rapidly under damp conditions, and consequently good drainage is an important consideration in checking the disease. It has been found that the cases of the disease recorded among trees growing on higher ground are frequently as abundant as those recorded among trees growing on damp lowlying land, during the first years of cultivation; yet the number of cases of the disease among older trees is far greater on the heavy lowlying land than on higher ground ; and this appear to be due to the more rapid growth of the fungus under damp conditions.

Observations on the use of artificial fungicides for preventing the disease from attacking trees or for curing diseased trees would indicate that their employment has not yielded satisfactory results. Two fungicides applied to the soil, one a liquid and the other a solid, appeared to have no effect in arresting the growth of the mycelium. The application of fungicides to the roots of the trees cannot be said to have met with success. The fungicides cannot be applied to all of the roots, they are usually used near the root bases and on the tap roots; they are not permanent, and although they may prevent infection for a time from occurring on the roots near the collar they have no effect on the more remote parts of the lateral roots on which infection usually commences. The application of a fungicide on the surface of an attacked root does not kill off the fungus within the tissues of the root. And, finally, it is doubtful whether such a method of treatment, providing it were to give satisfactory results, would be applicable over a large area.

After studying the number of plants of different species, both cultivated and wild, it has been concluded that a selective method of stumping, *i.e.* the removal only of the stumps of those jungle trees which are known to harbour the fungus, would be impracticable, owing to the fact that it is not considered to be possible to limit the species to any small number. It has been concluded after a large number of observations that the majority of cases of attacks from " white ants " (*Termes gestroi*) among older trees follow on previous attack by the root fungus, although there are many cases among young trees in which the " white ants " appear to attack the trees without any sign of previous injury. Accordingly, it may be expected that the number of " white ant " attacks would be diminished if the root fungus were eradicated from the planted area.

ii. The brown root disease, caused by *Hymenochaete noxia* has been recorded up to the present on fifteen estates in different

districts. It is, however, present only in small quantity on each estate.

The more important points in connection with this disease are that the fungus grows very slowly and that it does not spread through the soil even under very damp conditions; consequently its action is usually limited to a single tree at each point. Isolation by a trench and liming are unnecessary, it being only necessary to take up the dead roots present under-ground.

The disease is entirely of secondary importance to the "common root disease" and is more easily and cheaply treated.

When the tree has recently died it is easily identified by means of dark-brown growths on the surface of the roots, more particularly usually on the tap root; but where a tree has been left standing for some time it is often not so easily identified, and cases of the disease are for this reason frequently supposed to be due to "white ants" or other causes. A curious feature of the disease is the accumulation of earth and small stones by the brown fungus growth, it being frequently necessary to wash the roots before the brown growth becomes visible.

No other root diseases have been recorded in this country. *Irpex flavus*, a fungus which has been said to attack the roots of the plant, has been recorded only has a saprophyte. This fungus has been said to attack coffee and clove trees in Malacca. A fungus know as *Helicobasidium mompa*, which has been said to be a root parasite, has not been found in this country. It has been recorded as the cause of a mulberry disease in Japan. Judging from specimens of Para rubber which I examined at Kew in 1909 and which were supposed to be affected with this fungus, it appears to have been confounded with the brown root fungus, *Hymenochaete noxia*. Another root disease which has been reported from Ceylon as being due to *Sphaerostible repens* has not been recorded here.

Stem Diseases.

i. The "die-back disease," caused by the *Diplodia*-form, has been commonly met with in all parts of the F. M. S.

The fungus is very widely distributed and is one of the commonest fungi occuring in this country, it being only necessary to expose to the air a cut surface of potato, pineapple or such medium for a few days in order to obtain a growth of the mycelium.

This fungus must enter through a dead or wounded part of the plant before it can produce disease. Such fungi are not regarded as virulent sources of disease unless they are provided with ample means of entrance, that is follow on attacks by other organisms.

The *Diplodia*-form has been found to follow readily on attacks by the pink fungus (*Corticum javanicum*) and by another fungus (*Phyllosticta ramicola*) and to magnify the damage caused by these

two fungi, entering on the dead part and frequently completing the death of the tree to its base.

The methods of treatment are the removal of attacked branches, and their destruction either by fire or by burying them with lime, the sealing of all wounds with coal tar and the establishment of good methods of cultivation and drainage. Spraying has been often suggested as a method of treatment for the fungus; but, in view of the fact that the fungus only enters the tree at some dead surface, it is regarded as being unnecessary to spray the tree. As the fungus lives readily on all dead parts of the plant, care should be taken to destroy dead branches which may be lying on the ground either during pruning or at other times.

Several cases of a root disease caused by the fungus have been recorded during the year on very young plants which had been recently planted; the fungus in such cases enters through the cut ends of the tap root or lateral roots. This indicates the necessity for tarring the cut end of the tap root as soon as the plants are lifted from the nursery and for allowing the plants to lie exposed for as short a time as possible before they are planted out

ii. The death of the tips of shoots of trees was recorded as being due to a minute fungus which has been described from Ceylon by Petch and named *Phyllostica ramicola*. This fungus when described from Ceylon was not regarded as a parasite; but Petch has identified specimens of the fungus sent to him from here as being identical with the Ceylon fungus, and from observations on the fungus in this country and from the fact that I was able to kill off young shoots by inoculating with it and to reproduce the fungus on the dead and dying parts there appears to be no doubt that it is an active parasite. It was first suspected as a parasite in July and the extent of the damage attributed to it on the six estates on which it was recorded during the year is indicated thus:—

Date of record.	No. of trees.	Area.	Age of trees.
15. 7. 11.	35,	4 acres.	6 months.
20. 7. 11.	6.	2 ,,	15 ,.
20, 7. 11.	2.	(adjacent trees)	18 ,,
25. 8. 11.	36.	1 acre.	24 ,,
20. 10. 11.	4.	(Not known)	(Not known.)
12. 12. 11,	50.	5. acres.	18 months.

The disease has only been recorded on trees of approximately two years or under. The fungus attacks the upper parts of branches or of the leading shoot, commencing usually at a distance of about a foot below the tip, although it may attack it at the extreme tip in some few cases or lower down. A dark-brown patch is produced which increases in size, spreading both up and down, and takes the from of a greyish patch bounded by an outer dark-brown border. The outer brown border represents the advancing area of the disease.

The fungus itself is scarcely visible to the naked eye, taking the form of very minute black points on the dead shoot. It possesses very small colourless spores which are extruded from the black points in strings or tendrils adhering together in small white masses. As the fungus attacks healthy green parts, it is assumed that it infects by the germination of spores on the outer surface of the shoot. The spores may be wind-borne, but insects also probably play an important part in distributing them.

The portion of the shoot which is killed off by the fungus appears to be limited to the uppermost three feet, the more woody parts of the shoot escaping infection, *i.e.*, the fungus does not appear to travel down the shoot for any great distance. The damage is accordingly not very great, except in so far as the growth of young trees is retarded by the death of the main shoot. It has, however, been found that the *Diplodia* follows very readily, entering on the dead shoot, producing the dying back and in many cases killing the plant down to its base.

From the conclusions drawn as to the nature of the fungus, the treatment which has been recommended is to make a careful observation and to cut off the top shoots as soon as they are attacked, tarring the cut ends with a mixture of coal tar and clay.* In this way the attack from the "die-back" fungus is prevented; a branch arises from below the cut part and growth is continued. So much for curative measures. A preventive treatment is, however, necessary and for this it was recommended that all trees within the infected area should be sprayed, the objects of this being to prevent the spores from germinating on the young shoots. A mixture prepared from 8 lb. of sulphur, 10 lb. of quicklime and 50 gallons of water was recommended for use, the spraying to be repeated at intervals of 8 weeks. This mixture was recommended in place of Bordeaux Mixture on account of its action in keeping off insects as well as its fungicidal properties. I have on record an area which was thus treated comprising four acres of trees of six months of age. The treatment was commenced at the end of July. Up to the end of August I learnt that three or four more cases of the disease had been recorded and one or two in September, after which there was no further record of fresh cases up to the end of the year. Another area of five acres is being similarly treated.

The loss arising from this fungus is not great, providing that the "die-back" fungus can be prevented from attacking the trees.

It is important to note that a copper sprayer cannot be used with sulphur compounds owing to the action of the sulphur on the copper. A *tin-lined* sprayer of the type of the Vermorel "Eclair"

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*The object of using clay, mixed with the tar so as to form a thick paste, is to prevent the tar from running down and killing off the young bark.

is recommended. Much requires to be done on the reproduction of disease, the hosts of the fungus &c.

iii. The "pink disease" caused by *Corticium javanicum*, has been reported from estates in ten planting districts. It was, however, found only in small quantity; and there has been no apparent necessity to apply preventive treatment in order to arrest the spread of the disease.

The fungus produces pink growths in the fork of the tree usually, but sometimes also at the point of union of the smaller branches, and kills off the bark beneath it, eventually ringing the trunk and causing the death of the branches above. "Cankers" in the fork are frequently caused by this fungus where its growth is limited to a small area of the bark.

The fungus effects a considerable loss in Java where, according to recent work, it has been recorded on a very large number of species of plants. It also appears to be more prevalent in Ceylon than it is in this country.

iv. A "thread blight" fungus was recorded on two estates. It was present in small quantity only, and the pruning and burning of the young branches appears to have checked it.

The fungus grows in the from of white threads on the young branches and leaves, killing of the younger parts of the shoot.

I have recorded it also on camphor (*Cinnamomum camphora*) and on the guava (*Psidium Guava*). It probably occurs on wild plants in the jungle. In all cases in which it has been recorded the attacked trees have been very close to the jungle. The fungus has never been found to fructify, and its dispersal appears to be limited to growth from one branch to another in contact and to the blowing of leaves containing threads and thier lodgment against branches.

v. A silvery white fungus appeared on the bark of some trees on one estate. It appeared to do no damage to the plant, but merely to disintegrate the outer bark. The trees were periodically flooded at certain times of the year, and the fungus growth appeared near the base of trunk. It was recommended that the trees should be painted with a lime-sulphur mixture.

(*to be continued*)

AFRICAN OIL PALM.

African Oil Palm. Seeds of *Elaeis guineensis* (African Oil Palm) can now be obtained, in fairly large quantities, from this Department on application to the Director of Agriculture, F. M. S. Kuala Lumpur.

MEETING OF THE PLANTERS' ASSOCIATION OF MALAYA HELD AT THE STADTHOUSE, MALACCA, ON JUNE 30TH, 1912.

PRESENT:

Mr. E. Macfadyen (in the chair).
Mr. H. C. E. Zacharias, Secretary. Mr. W. G. Dobson, Legal Adviser, and the following delegates:—

Mr. A. Dupuis Brown from the Negri Sembilan Planters' Association.

Mr. F. J. Dupuis from the Kuala Langat District Planters' Association.

The Hon. H. M. Darby, Mr. R. W. Fox-Male, Mr. G. H. Gutteridge } from the Malacca Planters' Association.

Also the following visitors:

Messrs. J. R. O. Aldworth, L. Lewton-Brain, C. W. Keppe-Powis, Wm. Sime, S. W. Moorhouse, J. G. Barclay, J. H. M. Staples, W. H. Barnes.

1. The Chairman explains that, there being no quorum, all business transacted at this meeting will have to be validated at the following one. Subject to this provision, the minutes of the meeting held on May 19th are confirmed.

NEW YORK EXPOSITION.

The *Secretary* reports that Mr. C. E. S. Baxendale has been appointed to represent officially this Association at the New York Exposition.

Mr. Lewton-Brain informs the meeting that an exhibition of all rubber entered for the New York Exposition has been held at Kuala Lumpur on the 24th instant. About 20,000 lbs. of very fine rubber from about 90 estates was being sent, and he felt confident that the whole would prove an excellent advertisement. He was also forwarding samples of seeds of coconuts and copra, of models photographs, etc., etc.

Mr. Macfadyen points out that the P.A.M. was under a great obligation to the Government for so generously guaranteeing the whole expenditure, and to the Department of Agriculture for making such arrangements. He considered it was distinctly up to the planters to do the fair thing now and pay their share of the cost of this Exhibition and he appealed to them all to impress this on their respective Boards.

Education on Estates.

The *Secretary* reports having circularized the various districts. The following replies had been received regarding Evening Classes in actual existence, viz :—

Name of Estate.	No. of Scholars.
Jugra (Kuala Langat)	10
Klanang (Kuala Langat)	7
Bukit Tembun (Province Wellesley) ...	30
Prye (Province Wellesley)	46
Chersonese (Perak)	68
S. Gedong (Perak)	45
Batu Kawan (Province Wellesley) ...	35
Malakoff (Province Wellesley)	20
Gula (Perak)	97
Caledonia (Province Wellesley)	79
S. Patani (Kedah)	10

Mr. Aldworth gives a short history of how this question had arisen and intimates that the Government would far rather not resort to compulsory measures, if the planters generally would be willing, voluntarily to carry on educational work on the lines already adopted by some estates. Perhaps it would be advantageous, if the curriculum could be made to include a little Malay. The Government would of course pay grants to all schools that earned them in accordance with the provisions of the Education Code.

Mr Darby remembers a scheme for a Tamil School at Port Swettenham many years ago which however had come to nothing. He certainly did not think that children should be forced to go to these schools, but that classes should be provided for those that wished to avail themselves of them.

Mr. Dupuis-Brown considers a school after the type of the Tamil school at Seremban the best and most efficient method of imparting education. He anticipated great trouble in obtaining the necessary teaching staff.

Mr. Macfadyen differs from the last speaker and considers the Anglo-Tamil School at Seremban to be just the type of school they did not want to encourage. They wanted to keep their children on their estates and were anything but anxious that the children should receive an English education. They were all much obliged to Mr. Aldworth for putting the matter so clearly to them. They had been given a hint and they would be wise to act on it.

The *Secretary* is instructed to forward the information received to the Protector of Labour ; to express a sympathetic attitude ; and to suggest that a Sub-Committee of the P.A.M. consult with the Protector of Labour and the Director of Education regarding the better organization of the evening classes above referred to.

Labour Code.

The *Secretary* reports that the Memorandum on this bill had been forwarded to the Chief Secretary.

Mr. Darby proposes three additions to the memorandum:

(1) It should be made compulsory that an abstract of all sections directly affecting the cooly in relation to the employer and vice versa, should be printed in the vernacular and posted up in each cooly line.

(2) With reference to the Indian Immigration Fund the assessment levied for the second year and onwards on a cooly, so long as he continues to work for the employer who recruited him, should be levied at a nominal rate only. Why should an employer have to continue to pay the higher assessment on the same cooly year after year?

(3) Section 108 between the word "district" and "shall" insert the words: "after having given the management in charge 48 hours notice in writing."

Mr. F. J. Dupuis seconds these additions and it is resolved to forward them to the Government of the F.M.S.

Medical Staff of Estates.

The *Secretary* reports having forwarded the memorandum, as decided upon, at their last meeting.

Mr. Darby informs the meeting that in Malacca the Straits Government intended putting up a number of hospitals of their own and that the planters would simply be charged for making use of them.

Repression of Drunkenness.

The *Secretary* reports having forwarded to the Chief Secretary a memorandum of the Standing Committee and reads the following reply received:

No. 2 in 4948/1912.

Kuala Lumpur,
Federated Malay States,
13th June, 1912.

Sir,

I am directed by the Chief Secretary to acknowledge the receipt of your letter dated the 12th June on the subject of the sale of foreign liquors to Indian Coolies and to inform you that steps have already been taken to effect this object.

It has been decided to issue futher licences for the sale of foreign intoxicating liquors with a condition prohibiting the sale of them to Agricultural Labourers from the Madras Presidency. It will not be possible to enforce this condition for a few months as some notice has to be given and it will be necessary for the Planters to assist the Police by giving information as to breaches of the condition so that the Licensing Boards may be able to deal with offenders.

This matter is one in which the Government entirely agrees with the Planters and if the means now taken are not effective further steps will be considered.

The Secretary, I have, etc.
The Planters' Association of Malaya, (Sd). J. F. OWEN.
Kuala Lumpur. Ag. Under Secretary, F. M. S.

Mr. Macfadyen gives a history of the presistent demands made by the planters for years on this question and welcomes the fact that their claims had at last been met. The steps now contemplated by the F.M.S. Government were steps in the right direction, but most probably further legislation would be necessary particularly in the direction of making it an offence for a Tamil coolie to be in possession of any liquor.

Mr. Darby considers that the Colonial Government should be similarly approached. As regards toddy, he personally would have liked to see the restriction extended so as to include toddy.

Mr. Aldworth remarks that fresh toddy distilled in a clean still had very little alcololic strength but that the strength went up by 50%, if the still was allowed to contain stale toddy.

GHENT EXHIBITION.

The *Secretary* reads the following letter :

The Secretary,
The Planters' Association of Malaya,
Kuala Lumpur.

Singapore, 21st May 1912.

Sir,

I have the honour to inform you that a Universal and International Exhibition to which the foreign Government have been invited, will be held at Ghent in 1913, under the Patronage of H.M. the King of the Belgians.

Under separate cover I am sending you :

(1) General Program of the Exhibition, including the regulations.

(2) Classification.

(3) Plan of the buildings and grounds which will cover about 250 acres.

(4) Forms of Application for admission of exhibits.

An Official Catalogue will be issued, as per prospectus enclosed, and exhibitors will be entitled to have four lines therein reserved to themselves, free of charge.

The exhibition being an international one, a large area has been reserved for non-Belgian exhibitors.

I shall be obliged if you will kindly draw the attention of the members of your Association to this forthcoming exhibition which

promises to be as great a success as those previous held in Belgian cities, viz: Antwerp, Brussels and Liege.

I shall be glad if desired to obtain further information or give any such assistance as may be in my power, to attending exhibitors.

I have, etc.

(Sd). M. TRAUB,

Acting Consul for Belgium.

Mr. Sime considers the Association should participate. Some manufacturers were still unaware that they could depend on obtaining sufficient quantities of one and the same quality of plantation rubber. He was strongly of opinion that every opportunity should be taken to advertise the Malay Peninsula as a rubber producing country.

Mr. Gutteridge proposes that no definite steps be taken, but that the opinion of the Government and of the P. A. M. be first obtained.

Mr. Dupuis Brown seconds this proposal which is carried unanimously.

HONORARY MEMBERS.

Mr. Macfadyen proposes and Mr. Darby seconds the list of Honorary Members put forward by the standing Committee, viz: Messrs. John Turner. E. V. Carey, R. W. Harison, C. Malcolm Cumming and H. N. Ridley, C. M. G. This is agreed to unanimously.

Mr. Darby gives notice that he will propose at the next meeting the name of Mr. Thos. H. Hill; and Mr. *Macfadyen* that of Mr. John Gibson as Honorary Members.

P. A. M. JOURNAL.

The *Secretary* reports having circularized all districts and that the general opinion is favourable. He also reads the following letter from the Director of Agriculture:

Office of Director of Agriculture,

No. (11) in 86/1912. Federated Malay States,

Kuala Lumpur, 19th June, 1912.

Sir,

I understand that this Department is to commence a monthly periodical shortly, for the Federated Malay States.

I should be glad to know whether the Planters' Association of Malaya would support this and if so to what extent and on what terms.

I would be obliged if you would consult the Standing Committee about this and let me have their opinion, as I wish to prepare an estimate for the next half year as soon as posible.

The Secretary I have &c.

Planters' Association of Malaya, (Sd.) L. Lewton-Brain,

Kaula Lumpur. Director.

Mr. L. Lewton-Brain intimates that the publication of a Journal by his department had been decided upon and that he hoped to bring out the first number in August. He would suggest that this new Bulletin be made the joint official organ of the Department of Agriculture and of the P. A. M. The estimated cost for one year was $3000. It was now for the P. A. M. to say whether they wished to share cost and ownership, or whether they would prefer to pay a lump sum for a restricted number of copies.

Mr. Dupuis Brown is not in favour of the P.A.M. binding itself at once, without giving the matter some furthur consideration.

Mr. Darby proposes that the joint venture be tried as an experiment for one year; the editor in full charge to be the Director of Agriculture, F.M.S. He understands that all P.A.M. minutes will be printed in full in this Journal and that the Association would therefore in future save all bills for printing minutes, etc., separately.

Mr. Gutteridge seconds Mr. Darby's proposal, which is carried.

H. C. E. ZACHARIAS,
Secretary, P. A. M.

FEDERATED MALAY STATES.

Comparative Statement of Cultivated Rubber Exported during the Years 1912 and 1911.

Produced in	Exported during June, 1912.	Previously.	Total Export during the year.	Export during similar period of previous year.	Increase.
	lbs.	lbs.	lbs.	lbs.	lbs.
Perak	769,503	3,725,887	4,495,390	2,207,653	2,287,737
Selangor	1,133,264	6,970,185	8,103,449	4,578,697	3,524,752
Negri Sembilan	391,440	2,349,132	2,740,572	1,554,589	1,185,983
Pahang	11,708	31,146	42,854	8,458	34,396
Total ...	2,305,915	13,076,350	15,382,265	8,349,397	7,032,868

Exported viâ	To United Kingdom.		To Continent of Europe.		To Ceylon.		Total.	
	June.	To date.	June.	To date.	June.	To date.	June.	To date.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Port Swettenham ...	1,102,455	7,806,921*	154,369	1,048,000	51,973	488,885*	1,308,797	9,303,806

* 63,376 lbs. and 11,688 lbs., respectively, exported in April, 1912, but omitted to be published in that month, are now included.

KUALA LUMPUR,
9th July, 1912.

W. J. P. HUME,
Commissioner of Trade and Customs, F.M.S.

PAHANG.

Abstract of Meteorological Readings in the various Districts of the State for the Month of June, 1912.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	TEMPERATURE.				HYGROMETER.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
District Hospital, Kuala Lipis.	...	...	81.2	89.1	69.0	20.1	75.7	...	...	...	...	3.16	1.25
do. Ramb ...	...	...	81.7	90.3	72.3	18.0	76.7	...	...	...	...	5.33	0.79
do. Bentong ...	...	...	81.7	90.1	70.5	19.6	76.1	...	...	...	...	3.37	0.99
do. Pekan ...	...	...	81.7	89.6	73.0	16.6	77.9	...	...	...	...	3.75	1.14
do. Kuantan ...	...	...	79.9	91.0	...	...	73.9	...	...	...	...	11.12	3.15
Dispensary, Temerloh ...	...	...	...	90.7	69.2	21.5	...	...	...	...	...	2.95	0.70
Sungei Lembing ...	...	...	...	86.8	74.5	12.3	...	...	...	...	...	9.37	1.25
Kuala Tembeling ...	...	...	...	...	...	...	...	...	...	...	...	6.13	2.60

OFFICE OF THE SENIOR MEDICAL OFFICER,
Selangor, Negri-Sembilan and Pahang.
Kuala Lumpur, 16th July 1192.

(Sd.) G. D. FREER,
Senior Medical Officer,
Selangor, Negri-Sembilan and Pahang.

NEGRI-SEMBILAN.

Abstract of Meteorological Readings in the various Districts of the State for the Month of June, 1912.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
District Hospital,													
,, Seremban	...	149.4	80.8	88.2	73.1	15.1	76.6	0.834	73.7	79	S. W.	3.35	0.82
,, Tampin	...	143.0	80.9	87.4	74.4	13.0	77.4	0.854	75.0	82	...	9.96	2.64
,, Kuala Pilah	...	...	81.2	89.9	74.6	15.3	77.5	0.872	75.0	81	...	6.21	1.44
,, Jelebu	...	...	...	...	...	...	...	...	...	...	...	1.95	0.65
,, Mantin	...	..	...	...	...	...	...	...	...	...	...	2.20	0.55
,, Port Dickson	...	...	81.9	87.4	75.2	12.2	77.9	0.881	75.3	80	...	8.55	1.49
Beri-beri Hospital ,,	...	...	...	...	...	...	...	...	...	...	...	6.74	2.17

OFFICE OF THE SENIOR MEDICAL OFFICER,
Selangor, Negri-Sembilan and Pahang.
Kuala Lumpur, 16th July, 1912.

(Sd.) G. D. FREER,
Senior Medical Officer.
Selangor, Negri-Sembilan and Pahang.

SELANGOR.

Abstract of Meteorological Readings in the various District of the State for the Month of June, 1912.

DISTRICT.	Mean Barometrical Pressure at 32° Frh.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital Kuala Lumpur.	29.650	147.9	82.7	90.1	73.6	16.5	77.2	0.146	74.0	75	Calm.	5.24	1.15
Prisons. „ „	...	...	...	...	...	...	...	..	...	...	...	4.57	1.26
District Hospital, „	...	...	...	...	...	...	...	...	...	...	...	4.27	2.40
„ Klang	...	...	...	93.8	74.6	19.2	...	...	...	...	...	2.33	0.72
„ Kuala Langat	...	...	...	90.8	69.9	20.9	...	...	...	...	...	6.26	2.00
„ Kajang	...	...	...	86.9	76.1	10.8	...	...	...	...	...	5.58	1.10
„ Kuala Selangor	...	...	...	89.9	71.3	18.6	...	...	...	...	...	1.01	0.40
„ Kuala Kubu	...	...	...	91.6	07.6	21.0	...	...	...	...	...	3.88	0.72
„ Serendah	...	...	...	92.8	07.6	22.2	...	...	...	...	...	3.82	2.40
„ Rawang	...	...	...	91.6	72.8	18.8	...	...	...	...	...	8.14	1.30
Sabah Bernam												4.70	2.75

OFICE OF THE SENIOR MEDICAL OFFICER.
Selangor, Negri-Sembilan and Pahang.
Kaala Lumpur, 16th Julq 1912.

(Sd.) G. D. FREER.
Senior Medical Officer,
Selangor, Negri-Sembilan and Pahagang.

PERAK.

Abstract of Meteorological Readings in the various Districts of the State for the Month of June, 1912.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	TEMPTATION.				HYGROMETER.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Taiping	...	106	83.74	95	71	24	78.34	898	...	79	...	2.42	72
Kuala Kangsar	...	...	81.33	94	71	23	77.06	873	...	83	...	4.04	1.13
Batu Gajah	...	96	82.69	93	71	22	77.64	880	...	79	...	3.07	1.00
Gopeng	...	...	81.72	93	68	25	76.18	828	...	77	...	11.10	4.58
Ipoh	...	...	82.37	93	70	23	77.19	864	...	79	...	5.41	1.58
Kampar	...	...	82.43	94	70	24	77.32	870	...	79	...	7.08	2.40
Telok Anson	...	...	82.62	93	71	22	78.57	921	...	83	...	5.24	3.65
Tapah	...	...	82.17	92	69	23	77.41	878	...	81	...	6.10	1.29
Parit Buntar	...	...	83.10	92	71	21	77.78	880	...	79	...	4.29	2.62
Bagan Serai	...	...	83.57	92	71	21	78.62	913	...	81	...	4.23	2.28
Selama	...	...	82.83	94	70	24	78.91	936	...	85	...	3.95	1.70
Lenggong	...	...	80.16	94	68	26	77.01	888	...	87	...	4.11	1.85
Tanjong Malim	...	...	81.35	93	67	26	77.92	912	...	87	...	9.19	2.06
Grit	...	...	80.84	93	71	22	76.55	858	...	82	...	2.76	1.02
Klian Intan	...	...	...	...	...	...	...	...	...	...	...	1.80	81
Pulau Pangkor Laut	..	...	...	...	...	...	...	...	...	...	...	3.27	96
Kuala Kurau	...	...	...	...	...	...	...	...	...	...	...	4.66	2.00
The Cottage	...	...	...	...	...	...	...	...	...	...	...	18 50	4.50
Maxwell Hill	...	...	...	...	...	...	...	...	...	...	...	10.96	1.58

OFFICE OF THE SENIOR MEDICAL OFFICER,
Taiping, 10th June, 1912.

S. C. G. FOX.
Senior Medical Officer.